The Impacts of Decentralization on Health Behaviors in Uganda

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The Impacts of Decentralization on Health Behaviors in Uganda

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Abstract

This paper examines the impacts of a public sector decentralization program on the demand for health care in Uganda in the 1990s. This work is an extension of a previous paper, which provided evidence of a shifting of priorities by local governments in Uganda's decentralized health system away from provision of primary health care, in particular the provision of public goods or goods with substantial consumption externalities, and toward provision of private health goods such as curative care. This work furthers that analysis by examining how local planners' allocation decisions—among these different types of primary health care and curative care services—affect individual-level health behaviors This analysis finds that, while the country has been undergoing a multitude of changes in recent years, decentralization appears to have led to increases in the use of curative services with exclusively private benefits, perhaps at the expense of use of primary health care services and services with consumption externalities. A longer period of analysis is required to determine the persistence of these effects.

Background

In recent years, decentralization of responsibilities from central to local governments for service provision, supervision and resource allocation decisions has become an increasingly common strategy for addressing a variety of ills in developing countries. Decentralization, it has been argued, can reduce technical inefficiency (Rondinelli et al. 1983; World Bank 1997), can reduce bureaucracy and increase the speed of decision-making (Silverman 1992; Mills 1990), can increase representation by local populations—and therefore the potential for improvements to be more sustainable (World Bank 1997; Thomas 1997), and can bring service provision more in line with local preferences (Tiebout 1956; Oates 1972, Musgrave 1983). In its Health Financing Policy Paper, the World Bank (1987) proposed decentralization as one arm of a sector reform strategy that has since become a standard policy prescription in international development assistance.

In spite of the strong faith placed in decentralization by donor agencies and developing countries, recent empirical evidence has found that decentralization, if undertaken without sufficient planning or strengthening of appropriate institutions, may lead to outcomes that are potentially worse than centralized systems, leading instead to fragmented planning, inadequate consideration or funding of recurrent expenditures, local capture, or under-provision of certain types of services (Akin et al. 2000, Mills 1990, Jeppsson 2001, Schwartz et al. 2001).

The central goal of this paper, however, is to extend further the study of decentralization's effects in developing countries to determine whether decentralization can actually achieve the ultimate aim of most health sector reforms—improving the

health status of populations. Specifically, this paper uses data from local government health budgets and population-based household surveys gathered during the decentralization process in Uganda in the 1990s to evaluate whether decentralization has been associated with changes in health behavior.

Uganda, a sub-Saharan African country of approximately 21 million people, has been undergoing a process of decentralization of most public sector services since the mid-1980s. This process, not isolated solely to the health sector, has involved transferring responsibility for service provision and supervision from the central government to the 45 districts in the country. Early steps in the decentralization process focused on administrative decentralization, creating new posts at the district level that had only limited accountability to the central ministries. In the health sector, the process of decentralization has been undertaken in addition to a variety of other reforms, including the introduction of user fees, experimentation with hospital autonomy, and implementation of pre-payment schemes. Starting in 1993, fiscal control over local health budgets was devolved in phases to district governments. By 1997, all 45 districts in the country had been given responsibility not just for service provision but also for carrying out other components of fiscal decentralization (Okuonzi & Lubanga 1997; Nsibambi 1998).

The mechanisms by which decentralization can affect health care demand are multiple and varied: (1) by increasing the level of resources used for health, (2) by using existing resources more efficiently to increase the supply of services for health or (3) by changing the mix of services to activities with greater impacts on health for a given level of resources.

Different incentives and preferences faced by local planners relative to central government planners can lead to increases in the level of resources available for health. For example, local governments might consider health to be a higher priority than the central government, thereby deciding to transfer resources from other sectors to the health sector. In Uganda, this does not appear to have been the case, at least during the initial phases of the decentralization process. In fact, local governments appeared to be less likely to allocate resources to health than had the center, unless the resources were designated transfers to the health sector from the central government (Jeppsson 2001). Furthermore, decentralization can improve incentives to collect taxes if decentralization permits greater retention of tax revenue by local governments. Decentralization might also lead local governments with greater fiscal powers to implement new taxes. In Uganda, there was some evidence of the former effect—increased tax revenue collection—at least for certain types of revenue, although districts were not permitted to institute additional taxes (Ministry of Local Government 1998).

The second mechanism by which decentralization can affect health demand, using resources more efficiently, could occur through several avenues. The most commonly cited is the removal of diseconomies of scale that result from attempting to coordinate from a central location disparate activities over a large geographical area or large populations. Goods with large fixed costs or with benefits extending to the country as a whole—regulation and standard setting, health information, licensing—may be more appropriately organized and run by the central government. Other services which involve a high degree of oversight and decision-making, on the other hand, may be prone to diseconomies of scale that would warrant their delivery at a more local level.

Decentralization could also improve technical efficiency if it fosters innovation or allows the use of local production techniques that the central government—essentially a monopoly provider of health care under centralized systems—has little incentive to develop. Whether transferring responsibility for service provision from the central government to local governments will improve technical efficiency may also be a function of the technical capacity at the local level—the extent of local expertise—and whether corruption, if it exists, is larger at the central level or at the local level (Bardhan and Mookherjee 1999).

However, the most commonly cited reason for promoting decentralization, at least in the economics literature, is to address differences in preferences across regions or population sub-groups for the services that governments provide. In the absence of cost savings or inter-jurisdictional external effects, decentralization can improve societal welfare by providing a level of health goods and services that better meets these different needs or preferences than a central government might if it provides a uniform set of goods and services across all regions (Oates 1972). In the health sector, different health needs across regions and therefore different preferences for health services, might arise when there are different epidemiological patterns or environmental conditions across regions. Local governments in some areas might be faced with larger problems of river blindness than other governments. Jurisdictions at lower elevations might face larger problems of malaria than jurisdictions at higher elevations or with different rainfall patterns. The central government might be unable, due to lack of information, or unwilling, because of the costs of collecting regionally specific information, to ensure that a different package of health services is provided in these different circumstances.

Local governments, having informational advantages or having constituents more willing to advocate appropriate services, may be better able to meet these different preferences and needs.

On the other hand, several factors might reduce or destroy the advantages of decentralization. Even in the face of differing preferences across regions, the benefits of decentralization can be offset in the presence of inter-jurisdictional external effects—health services which have benefits extending beyond the constituents of a particular local government. Such external effects might be present with services such as health education, vector control measures or other public goods activities. There is a decreased likelihood that public goods with external benefits to other jurisdictions will be provided (or provided in Pareto optimal amounts) in a decentralized system because local governments are unlikely to consider the benefits to constituents outside their jurisdiction.

A related problem with decentralization is the possibility of local capture by special interest groups, local elites, or perhaps even different ethnic groups (World Bank 1997, Bardhan and Mookherjee 1999). In such cases, the groups in power at the local level may have a strong desire to target resources to their favored groups. Because public goods are characterized in general by the inability to exclude consumption, this targeting behavior is more likely when private consumption goods (such as curative health care) are provided publicly. The result may be that local governments pay for private consumption goods for a targeted group rather than for public goods to be enjoyed by all.

This potential for local governments to have a lesser incentive to produce public goods can have substantial impacts on the health of populations, even if local

governments are well-meaning. As cited frequently in the public health literature, shifting resources from the health system, which historically has been oriented to curative care, to a core set of low-cost public health interventions aimed at preventable diseases can have substantial impacts on mortality and morbidity in developing countries (World Bank 1993). Developing countries have been accused of focusing on provision of tertiary curative care services, generally based in large urban areas, at the expense of primary and secondary services, which have greater impacts on preventable diseases and conditions.

The inherent question, therefore, is what types of goods and services are constituents most likely to express desires for and what types are local jurisdictions most likely to provide? There have been few empirical tests of the impacts of decentralization on allocations to different program areas, and no research, to the knowledge of these authors, has traced the impacts of decentralization on health behaviors. Two recent works have examined the issue of local preferences for health goods, finding that decentralization can lead to an increase in the supply of private goods at the expense of the supply of public (preventive) goods and services. Concern has been expressed (Akin et al 2000) that decentralization can lead to a decline in the share of budgets allocated to public goods or public health type activities. Schwartz, Racelis and Guilkey (2000) find a similar pattern in the Philippines.

This work looks at several different types of health services falling into both public and private goods categories. Using data from local government health budgets during a period immediately following the beginning of a decentralization process in Uganda, we examine how higher levels of allocations to different categories of goods—both on a per capita basis and as a share of budgets—affect whether individuals and

households consume various health services. The public or mixed public goods included in the analysis are diptheria, pertussis and tetanus vaccinations (DPT3), households' source of water, and household's toilet type, all of which have benefits extending beyond the direct users. DPT vaccinations reduce the likelihood that even unvaccinated children will suffer from these diseases. Water sources and toilets are often communally shared in Uganda; boreholes and pit latrines are often installed for entire communities. The private goods are curative care for children under age five and adults older than age 15. A third private good is antenatal care for pregnant mothers with benefits exclusively for the mother and her future child. The principal test will be to see whether individuals in those jurisdictions spending that more on a category – either as a share of the budget or on a per capita basis – are more likely to use those goods are services. A further test will be to examine time trends measuring the length of time that a district has been decentralized relative to the simple passage of time.

The next section describes the data used in the analysis. Section 3 presents the empirical framework and estimation strategy. Section 4 presents an overview of the results and section 5 concludes.

Data

Two sources of data are used in this analysis: annual district health workplans (budgets) and national population-based household surveys.

Annual District Health Workplans

This analysis uses annual district health workplans for fiscal years 1995-96 and 1996-97. Subsequent years are available and have been analyzed elsewhere (Akin and others 2001) but do not correspond to the years for which household survey data are currently available.

These data represent a unique opportunity to examine the impact of government expenditures on health behaviors. In the past decade, considerable effort has gone into collecting data on aggregate health expenditures for developing countries (Peters 1999; Berman 1997). Even so, such expenditure data are still available for only a minority of developing countries, and often, when available, reflect only national aggregates. The data that we use are unique because they are available at levels below the national level and because they can be categorized into different types of expenditures, thereby providing a detailed picture of local government preferences in the health sector.

The annual district health workplans are prepared by the District Director of Health Services and the District Health Management Team. The workplans list all of the activities that they plan to undertake in a given fiscal year. The activities include purchases of additional drugs, equipment and supplies; training; construction or renovation of buildings; support supervision; and other expenses incurred in direct service provision.

Districts began preparing workplans after they had been decentralized, beginning in fiscal year 1993/94. Comparisons of budgeting behavior by the central government before decentralization and by local governments after decentralization are not possible because comparable workplans were not prepared before decentralization. However, the decentralization process was not uniform across the country; some districts were decentralized before others. In fiscal year 1993/94, 13 of 39 districts received block grants, indicating the beginning of fiscal decentralization. In fiscal year 1994/95, an additional 13 districts received block grants followed by the remaining 13 districts in 1995/96. In 1997, several districts were divided, resulting in a total of 45 districts in the country. This phased decentralization process allows for comparisons of districts decentralized first with those decentralized later.

Workplans are available from a sample of these districts—those receiving support from the World Bank's District Health Services Project. Specifically, 12 workplans are available for fiscal year 1995-96 and 19 workplans for fiscal year 1996-97. As discussed elsewhere (Akin et al. 2001), this sample of districts is believed to be a random sample of districts in the country. At the very least, however, it is not believed that selection into our sample is correlated with the health behaviors that we examine.

For this analysis, activities have been categorized in two ways: (1) by disease or health area and (2) by type of activity. The interventions falling into each of the categories are summarized in Appendices 1 and 2. For the former categorization, just over half of the budgets are not directly attributable to a specific disease or health problem because they provide general support to the entire health system and not to a specific problem. Interventions for diarrheal diseases, for example, include such items as

training of health workers in diarrhea case management, purchases of Oral Rehydration Solutions, protection of springs, construction of boreholes, and health education. Interventions for environmental sanitation programs include health education, construction of pit latrines in communities, sanitation competitions, and construction of hand-washing facilities. MCH activities include such items as family planning programs; antenatal care; training of health workers in family planning, reproductive health and Integrated Management of Children Initiative (IMCI); and purchases of supplemental drugs and supplies. HIV/AIDS expenditures include health education; palliative care; training in case management of sexually transmitted infections; tracking and treatment of tuberculosis; and purchases of supplemental drugs.

The larger health areas, at least in 1995/96, were diarrheal diseases, sanitation programs and HIV/AIDS (Table 1). Overall expenditure was $2.93 per capita in 1995/96 and $4.03 per capita in 1996/97. Only diarrheal diseases experienced an absolute decline in expenditures between the two fiscal years.

Table 1. Per Capita and Budget Shares for Health Program Areas

Health Area	Budget Shares		Per Capita Exp.	
	1995/96	1996/97	1995/96	1996/97
HIV/AIDS	9.0%	9.7%	0.26	0.39
Diarrhea	17.9%	6.4%	0.63	0.29
Immunizations	2.8%	5.7%	0.07	0.21
Malaria	1.5%	6.2%	0.03	0.27
MCH	3.5%	9.0%	0.11	0.34
Nutrition	1.1%	2.4%	0.04	0.10
Sanitation	10.4%	8.1%	0.22	0.32
None	53.9%	52.5%	1.57	2.12
Total	100%	100%	2.93	4.03

Workplans were also categorized by type of activity. In collaboration with the Ministry of Health and the District Health Services Project, 13 categories were developed

based on normative concerns that districts were disproportionately allocating resources to activities that improved the welfare of health workers or local politicians, but had only minimal or very indirect impacts on the quality and availability of health services and the health of the population. The categories included: primary health care; information, education and communication activities; drugs; civil works; equipment; vehicles; monitoring and evaluation; operations and maintenance; salaries; support supervision; supplies; training; and other. Explicit descriptions of the components of each category are in Appendix 2.

A second categorization system aggregated specific types of activities by degree of "publicness" and contains implicit subjective judgments. Four categories were used: (1) public goods activities; (2) private or non-public goods; (3) support activities; and (4) other activities. The items contained in the "public" category included allocations for information, education and communication (IEC) activities; primary health care; and drugs. The IEC component is of an obvious public nature. Radio messages, community events, newspaper advertisements or signboards are generally both non-excludable and non-rival in consumption. A high proportion of the expenditure for drugs was for communicable diseases, such as basic childhood illnesses, sexually transmitted diseases or tuberculosis treatment. Provision of these drugs has important spillover benefits to non-recipients of the drugs. Many of the primary health care components—family planning, construction of pit latrines or bore-holes, distribution of insecticide impregnated materials—also have important public goods characteristics.

The second category—"non-public"—includes allocations to civil works, vehicles and equipment. While it was clearly recognized that all of the 13 types of interventions

are necessary components of any health system, for many of these activities the benefits accrue (indirectly) not just to consumers but often (directly) more realistically to the health workers themselves. Supplemental salaries have obvious benefits for health workers. Training, as well, often involves payment of per diems for health workers, a valuable salary supplement, particularly if government transfers are irregular. Vehicles are often used for personal transportation as well as official health business. Civil works—the construction of new clinics and very often new offices for senior district health management—are also necessary for public goods types of services, but most often are mainly used for providing curative care, the main benefits of which are to the direct recipients. Ideally, additional information on costs and effectiveness of facilities need to be available to determine their appropriateness. New clinics are very visible demonstrations of political commitment to health but may be less effective than other uses of money, particularly given low levels of utilization at existing facilities (Hutchinson 1999), and may not lead to higher levels of public goods or high externality producing goods.

Other components are less easily categorizable using this "publicness" criteria and are placed in two additional categories: support activities and other. Many activities of the District Health Team, such as supervision of health units and health workers, training of health workers, studies, payment of salaries, and maintenance of health equipment, are necessary for the proper functioning of the health sector, but are not directly categorizable as either public or private. "Other" is simply a catchall category for activities that did not fit in any of the thirteen subcategories.

For the two years for which workplan data are analyzed, a dramatic decline was observed in the primary health care and public category (Table 2). This finding is corroborated by evidence found in other studies (Jeppsson 2001). Increases were observed in both the private and support categories, both of which increased by about $0.60 per capita. Expenditure on public goods activities was still the largest category ($1.65 per capita in 1996/97 or 38 percent of the total budget), but its share declined from 49.5 percent to 38.1 percent. Private goods activities increased from $0.52 per capita to $1.11 per capita.

Table 2. Per Capita and Budget Shares for Type of Health Activity

Health Area	Budget Share		Per Capita Exp.	
	1995/96	1996/97	1995/96	1996/97
Primary Health Care	30.9%	19.7%	0.93	0.88
Info., Educ. & Comm.	3.3%	8.0%	0.10	0.31
Drugs	15.3%	10.4%	0.31	0.47
Public	49.5%	38.1%	1.34	1.65
Civil Works	9.2%	13.4%	0.28	0.61
Equipment	5.5%	7.6%	0.16	0.35
Vehicles	2.6%	3.4%	0.09	0.14
Private	17.4%	24.4%	0.52	1.11
Operations & Maint.	2.4%	2.8%	0.06	0.12
Monitoring & Eval.	1.0%	2.5%	0.02	0.11
Salary	7.7%	6.4%	0.24	0.26
Support Supervision	3.3%	3.9%	0.08	0.15
Supplies	3.7%	3.8%	0.10	0.15
Training	13.3%	16.6%	0.36	0.67
Support	31.4%	36.0%	0.86	1.46
Other	1.6%	1.5%	0.05	0.06
Total	100.0%	100.0%	2.77	4.28

National Household Surveys in 1995 and 1997

National household surveys have been conducted annually in Uganda since 1992. These surveys, based on the World Bank Living Standards Measurement Surveys (LSMS), have principally focused on collection of household expenditures and inputs

into household agricultural production. In some years, however, they have also collected information on individual-level health behaviors and health outcomes: prevalence of illness, source of curative care, basic childhood immunizations, use of antenatal and postnatal care, and breast-feeding. Data are also collected on household amenities such as source of drinking water, type of toilet facility and condition of the dwelling.

The Uganda National Household Surveys in 1995/96 and 1996/97 contained 34,795 and 34,145 individuals in 5,535 and 6,657 households respectively. In both years, community surveys collected information on the principal health facilities serving each enumeration area. However, such information was collected for only two-thirds of the enumeration areas. The effective sample was reduced further because annual health workplans were available for only 11 of 39 districts in fiscal year 1995/96 and 19 of 45 districts in fiscal year 1996/97. Therefore, the total number of individuals available for the analysis included 7,742 and 12,903 individuals in 1,157 and 2,473 households 1995/96 and 1996/97 respectively. Descriptive statistics for the principal dependent variables are shown in Appendix 3.

Empirical Framework

The empirical framework is intended to evaluate how decentralization has affected the use of public goods and preventive care relative to private goods and curative care. We examine this topic by looking at whether district governments that allocate greater resources—either in per capita figures or budget shares—to different health areas exhibit a greater likelihood that people will use those kinds of services. In addition, to control for factors related to decentralization but unrelated to the budgeting process, we include variables on time trends and the length of time of the decentralization process in a district. We then estimate the demand for different health services as a function of individual and household characteristics; local government health inputs; facility characteristics; and time trend variables.

We look at three different types of public or mixed public goods—DPT3 vaccination in children aged 12 to 35 months, household's source of drinking water, and household's type of toilet—and at two types of private goods—antenatal care in women giving birth in the last year and curative care in children under five years and adults aged 15 or older. In Uganda, close to 90 percent of women—87 percent in 1995 and 89 percent in 1997—make at least one antenatal care visit. DPT3 coverage rates for children aged 12 to 35 months are considerably higher than those found elsewhere—73.7 percent in 1995 and 83.1 percent in 1997. The majority of households have access to pit latrines and to boreholes. More than a third of children and adults report being ill in the 30 days prior to the survey, and of these, approximately 60 percent seek care from a modern medical provider, either government or private sector.

Table 3. Distribution of Responses for Dependent Variables

Dependent Variable	1995	1997
DPT3 Coverage (12-35 months)	73.7%	83.1%
Type of Toilet		
None	18.7%	15.7%
Pit latrine	76.6%	80.3%
Flush	4.7%	4.0%
Total	100.0%	100.0%
Water source		
Natural/River	42.7%	39.5%
Borehole	52.1%	55.1%
Tap	5.2%	5.4%
Total	100.0%	100.0%
Curative Care		
0-5 years		
Reporting illness	36.9%	37.2%
Using care	61.7%	61.0%
15 and older		
Reporting illness	32.7%	34.0%
Using care	59.2%	51.1%
Antenatal Care	87.0%	89.0%

We examine allocations to different program areas and their impacts on the corresponding services they are intended to promote. Specifically, we look at allocations to MCH programs to assess use of antenatal care, allocations to diarrheal programs to assess a household's source of water, allocations to sanitation programs to assess household's toilet type, and allocations to immunization programs to assess DPT3 vaccinations for children 12-35 months of age.

We also look at several different types of expenditures and budget share variables to examine their impacts on health behaviors. For each health behavior, we examine the impacts of the following variables:

- Total district health expenditure per capita

- Total public goods health expenditure per capita
- Total private goods health expenditure per capita
- Share of public goods health expenditure in total budget
- Share of private goods health expenditure in total budget

To examine whether the decentralization process worked over time to change behavior, we include three time variables: the number of years since the introduction of decentralization, the actual year of observation (1995 or 1996), and an interaction of the two time variables. In order to get the net impact of decentralization, simulations are run using the estimated coefficients on the variable for number of years of decentralization.

In addition to the program variables, individuals are linked to health facility data gathered in an accompanying community survey. Individuals are linked to the closest health facility—government or non-government—serving the enumeration area in which they live. Approximately 70 percent of the facilities to which individuals were linked are government owned. Facility characteristics include ownership, number and type of staff, availability of drugs and supplies, hours open per week, and prices of basic services. From the drugs and supplies, an index of facility capacity is constructed.

In order to control for the potential endogeneity of our program variables (budget shares and per capita expenditures) in estimations of determinants of health behaviors, district dummy variables were included in the estimations. This type of endogeneity might be expected if unobservable factors—such as the level of community input in the health planning process or attitudes toward children's health—affected both whether resources were allocated to those programs and whether individuals chose to use those

services. Not controlling for this potential endogeneity might lead to biased estimates of the impacts of our program variables on the health behaviors. In all of the estimations except those for antenatal care, the district fixed effects were jointly significant.

Probit estimations are undertaken on each of the dependent variables. Below, D_i is the health behavior of interest. For all dependent variables, estimations were run for the health area budget share and per capita expenditures on that health area. For each dependent variable, separate estimations were also undertaken for total health expenditure per capita, total public and private expenditure per capita, and share of the budget to public and private goods and services. The probit estimation equation is given by:

$$D_i^* = \beta_1 X_i + \beta_s F_j + \beta_3 P_k + \beta_4 D_k + \beta_5 Y_i + \varepsilon_i$$

where:

$D_i = 1$ if $D_i^* > 0$

$D_i = 0$ if $D_i^* \leq 0$

and

X_i = individual and household characteristics for individual i

F_j = facility characteristics in enumeration area j

P_k = program variable (budget share or per capita expenditure) in district k

D_k = district fixed effect for k districts

Y_i = years of decentralization and time variables

ε_i = individual level error term

All estimations are conducted in Stata with controls for clustering at the level of the enumeration area.

Results

The full set of probit estimations with the individual, household, facility, program variables and district fixed effects and are in Appendices 4 through 9. Table 4 below summarizes the directions of the effects and the levels of statistical significance on the program variables for 46 different probit estimations, each cell representing a different probit estimation.

The estimations provide considerable evidence of strong impacts of government inputs on use of curative care services, but negligible effects of government inputs on use of immunization services, antenatal care and access to safe water and sanitation. Specifically, for curative care for both children and adults, higher expenditures per capita are positively associated with the likelihood that ill individuals will receive curative care. A greater budget share to MCH programs and to private goods in general are also associated with a higher likelihood that ill children will be taken for curative care.

A similar relationship is not consistently observed for the other health services examined; higher expenditures or higher shares on public goods or on different program areas—sanitation, diarrheal diseases, immunizations, MCH activities—do not lead to higher probabilities that children are vaccinated or that households will have access to pit latrines or boreholes. For none of the health program variables—sanitation, immunization or diarrheal diseases—is there a positive and significant relationship between expenditures or budget shares and health resources available to the households.

Total expenditures per capita—the total amount that a district spends per person on health—are associated with greater likelihoods that individuals will use curative care and have access to pit latrines.

Table 4. Summary of Results

	Curative 0-5	Curative 15+	ANC	DPT3	Toilet	Safe Water
Expenditures Per Capita						
Total	+	+	0	0	+	0
Private	+	+	0	0	+	0
Public	+	+	+	0	0	0
Program Area	+	n.a.	0	0	0	0
Budget Shares						
Private	+	0	0	+	0	0
Public	0	0	0	0	0	0
Health Area	+	n.a.	0	0	0	0
Ratio of Public to Private	-	-	0	0	0	0
Years Since Decentralization Process Began	+	+	0	0	0	+

+,- indicate significant at the 5% level; 0 indicates no significant effect

The variables on years of decentralization are positive and significant in the curative care results but less so for the other variables. However, because of the interaction terms, discerning the impacts of the time trend and years of decentralization variables is not straightforward, and it is left to the simulations below to provide a clearer interpretation of the estimation results.

Referring to the more detailed results in the appendices, several individual and household factors also help to explain use of health services. Education plays a strong role. Children of more educated mothers are more likely to be taken for curative care when ill and to receive their DPT3 vaccinations. Households with more educated members are more likely to have pit latrines or flush toilets relative to having no source of toilet and are more likely to have access to a borehole or tap relative to having an

unsafe source of water. Education does not appear to be an important factor when adults choose whether or not to seek curative care or whether or not pregnant women use antenatal care. Income, measured in quartiles relative to the lowest quartile, is an important determinant of whether adults seek curative care, of whether children are taken for curative care or receive their DPT3 vaccination (highest quartile only), and whether or not households have access to safe water or adequate toilets. For all services except antenatal care and children's curative care, being in rural areas reduces the likelihood that services will be used or households will have access to the services, even controlling for individual, facility and health program effects. There is some evidence of gender inequity in use of services for children. Girls are somewhat less likely to receive the preventive care service (DPT3) but somewhat more likely to be taken for curative care, perhaps indicating that parents hold off on investing too heavily in girl children until it is necessary. However, the low levels of statistical significance on these variables do not warrant making strong conclusions in this regard.

For the four dependent variables linked to health facility variables, there is little evidence that facility characteristics have much influence on use of services, perhaps because it cannot be known from the data what alternative providers are available or whether households actually use the specific facilities to which they were linked. Even so, several of the results are worth noting. The index of facility capacity (an index of drug and equipment availability) positively affects whether children are taken for curative care (at low levels of statistical significance), whether women use antenatal care, and whether children receive their DPT3 vaccinations. The distance of the health facility from the community is negatively related to use of curative care and DPT3 vaccinations.

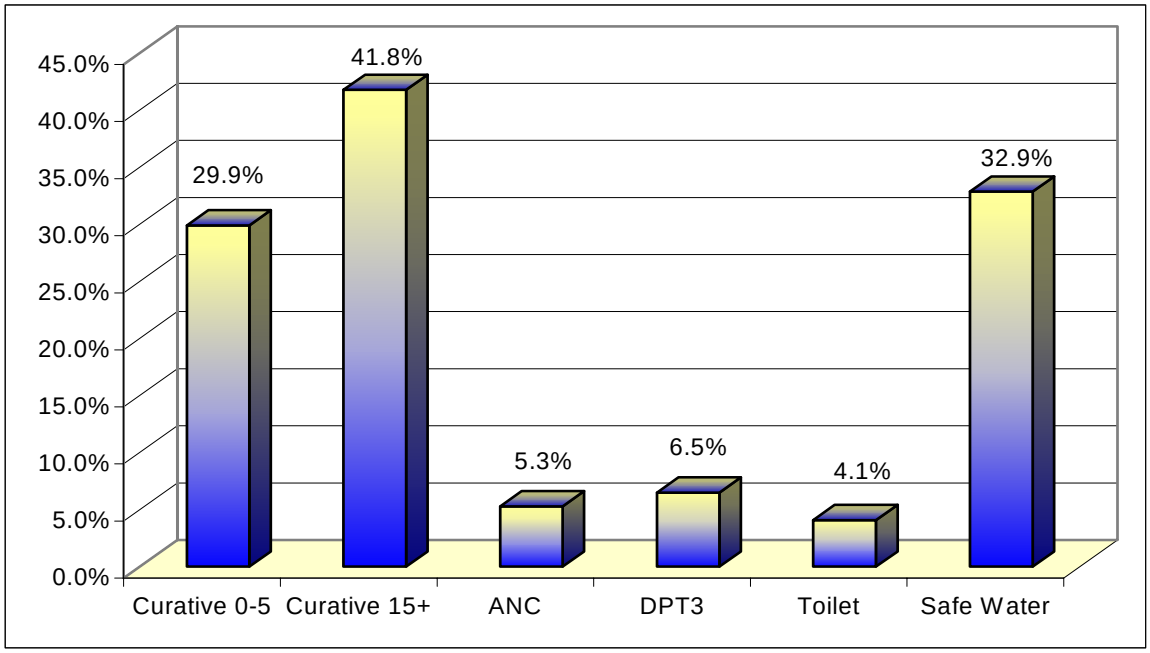
Government ownership is negatively related to use of antenatal care, a result that appears to help explain the positive price effect in the antenatal care estimation—pregnant women prefer private, higher quality (and therefore higher priced) care for their antenatal care check-ups.

Simulations

Two types of simulations were undertaken using the coefficients from the estimations of health behaviors: (1) the simulated effect of an additional year of decentralization and (2) the simulated effects of changes in the budget shares or per capita expenditures.

For each of the health behaviors, the effect of an additional year of decentralization is simulated while keeping the calendar year constant (Figure 1). The simulations provide considerable evidence that use of curative care is associated with the progression of the decentralization process, even controlling for the year of observation. The largest impacts of an additional year of decentralization are for the two curative care dependent variables. An additional year of decentralization would be associated with an increase in curative care use of 29.9 and 41.8 percent for children and adults respectively. A similarly large impact is observable for only one of the public goods—safe water. For the other three dependent variables—antenatal visit, DPT3 vaccination and adequate toilet—the impacts are positive but only 10 to 20 percent as large.

Figure 1. Simulated Effects of One Additional Year of Decentralization on Health Behaviors



Simulations were also conducted for the budget expenditure and budget share variables. In general, the simulations attempt to measure the impacts of equal sized changes in shares or expenditures across the different areas. For example, how would $0.50 spent on private care impact on curative care use relative to an identical $0.50 spent on public goods activities? Or how would an additional $0.20 spent on MCH services impact children's curative care use relative to the same $0.20 per capita spent on immunization programs? In general, the simulations are all within 1 standard deviation in the budget variables.

The simulations for the health program variables indicate that the impacts of private goods expenditures on use of private goods activities—curative care and antenatal care—are larger than those of public goods expenditures on use of public goods (Table 5). For example, an increase of $0.50 per capita in private goods expenditures would

increase the likelihood that curative care would be used by 8 percent for children and 13 percent for adults. A similar-sized increase for public goods would increase access to adequate toilets and safe water by 3.1 percent and 3.9 percent respectively. A similar result is evident for budget shares. Increasing the share of the budget for private goods would increase use of curative care for children by 7 percent and for adults by 5 percent. Increasing the share of the budget for public goods would increase DPT3 vaccinations by 3 percent, and increase access to safe water by 1.3 percent, but decrease access to adequate toilets by 0.4 percent.

Expenditures on different health areas seem to impact curative care use more strongly than the other health behaviors. Specifically, expenditures on MCH programs are more effective in affecting use of curative care than antenatal care. An increase of $0.20 in MCH expenditures would increase use of curative care for children by 18 percent, but increase use of antenatal care by only 1.7 percent. The latter result, however, may be more due to the fact that almost nothing affects use of antenatal care since antenatal care use is almost universal.

Table 5. Simulated Effects of Changes in Expenditures and Budget Shares on Health Behaviors

	Curative Care 0-5	Curative Care 15+	ANC	DPT3	Adequate Toilet	Safe Water
Expenditures per capita						
Private per capita of $0.50	8.3%	12.8%	1.0%	2.7%	6.0%	4.9%
Public per capita of $0.50	6.4%	5.9%	4.7%	-1.3%	3.1%	3.9%
Health area per capita of $0.20	18.0%	4.6%	1.7%	-4.6%	-0.1%	-1.7%
Change share of						
Private goods by 10%	7.0%	5.0%	-0.3%	5.1%	1.9%	-1.8%
Public goods by 10%	-3.8%	-0.4%	-0.4%	3.0%	-0.4%	1.3%
Health area by 10%	14.6%	1.1%	1.7%	5.8%	-0.8%	-0.3%
Ratio of public to private by 25%	-2.9%	-8.9%	0.1%	-1.0%	-0.2%	1.2%

Conclusion

The analysis to date, both from this work and from an earlier work (Akin et al 2001), indicate that there has been a shift in the emphasis of the health sector in Uganda during the decentralization process away from several preventive and primary health care services and towards private curative care services. This is a result that is fully in line with economic theories of decentralization suggesting local capture of public sector resources and targeting of benefits to preferred groups through services that are exclusionary. However, what alternative factors could also explain these changes? We consider two: the HIV/AIDS epidemic and shifts in donor priorities.

One potential explanation could be the current state of the health sector in Uganda and the potential for the AIDS crisis to alter health needs. Throughout the early and mid-1990s, Uganda experienced rapidly rising HIV/AIDS infection rates (UNAIDS 2000). It is certainly the case that the burden of HIV/AIDS on the health sector has increased over time. As a result, it is possible that local governments are responding to the crises by shifting resources from other health programs. This might have a particularly strong effect on curative care through efforts to address HIV/AIDS opportunistic infections.

A second explanation could be that shifts in expenditure patterns reflect shifts in the availability of resources, particularly from international donors. Declines in resources to services traditionally addressed by vertical programs may be the result of reduced international assistance in this area. It is certainly the case that reduced funding for immunization programs has reduced the number of fieldworkers conducting immunization outreach activities (UNEPI 1999).

However, neither the HIV/AIDS crisis nor shifting donor priorities can provide a full explanation. In fact, one would expect that these factors would have uniform effects across all districts or at least be randomly distributed across districts. Instead, we observe that these shifts are most apparent in districts that have been decentralized longer.

What this analysis shows, therefore, is that decentralization is doing exactly what it is intended to do—allowing local planners to respond to local preferences in a way that can impact on utilization patterns by individuals. What the analysis also shows is that the impacts of decentralization may not be in the areas intended by the framers of the decentralization process, since preferences in a decentralized health system are unlikely to conform to the preferences of the central government. Our analysis indicates that decentralization is positively associated with greater use of curative care services but shows no significant association with basic primary health care activities, such as childhood vaccination, access to safe water, nor access to adequate sanitation.

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Appendix 1. Types of Activities by Health Area

Health Area	*Activities*
Diarrheal Diseases	Water-testing, health education, construction of boreholes
Immunizations	National immunization days; supervision of EPI programs; monitoring and evaluation
Malaria	Insecticide treated materials; endemicity studies; IEC
Maternal and Child Health	Training of health workers, TBAs; family planning
Nutrition	Health education; demonstration gardens
Environmental Control and Sanitation	Pit latrine construction; health education;
HIV/AIDS/STIs	Palliative care; TB/Leprosy drugs and treatment; health education; condom purchases and distribution; STD drugs and treatment;
Other	Dental care; onchocerciasis; trypanosomiasis
None	Renovation; equipment; supervision; recurrent costs

Appendix 2. Types of Activities by Program Type

Type	*Description*
Civil works	New construction of physical structures, rehabilitation, renovation
Drugs	Purchases of supplemental vaccines and other drugs
Equipment	Purchase/"procurement" of durable goods (refrigerators)
Information, education, and communication	Home-visiting for education and awareness-raising, community sensitization and mobilizations, drama groups, radio and newspaper messages
Monitoring and evaluation	Routine monitoring of health situations (outcomes), communities; scientific studies; Health Management Information System
Maintenance	Operations and maintenance, utilities' expenses, day-to-day running of District Medical Officers' offices
Other	Meetings at district or community level, library, management, study tours, travel, transport, District Medical Officer office work
Primary health care	Delivery of preventive and basic curative services to secondary level or below, end products (Vitamin A, constructing wells, pit latrines, distribution of family planning supplies, procurement of insecticide impregnated materials, growth monitoring, outreach to AIDS patients, maternal and child health**)**
Salary	District Medical Officer's office salaries and allowances, other health staff salaries, incentives and allowances (excludes salaries and allowances for hospital staff since health unit staff are excluded)
Support supervision	Support supervision of District Medical Officer's office to district health workers or of central Ministry of Health personnel to District Medical Officer's office; monitoring and evaluation of health workers and process indicators (audits, performance reviews)
Supplies	Semidurable goods (uniforms, chemicals, office supplies)
Training	Health workers' courses and refresher courses
Vehicle	Purchase of vehicles, motorcycles

Appendix 3. Descriptive Statistics

	1995/96					1996/97				
Variable	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Dependent Variables										
Use curative care	2864	0.590	0.492	0	1	6549	0.539	0.499	0	1
DPT3 Vaccination	593	0.737	0.441	0	1	1295	0.831	0.375	0	1
Antenatal Care	330	0.870	0.337	0	1	764	0.890	0.313	0	1
Household Variables										
Toilet										
None/Outside	1186	0.203	0.151	0.002	0.524	3849	0.157	0.131	0.001	0.553
Pit latrine	1186	0.745	0.131	0.221	0.957	3849	0.803	0.115	0.331	0.955
Flush	1186	0.052	0.109	0.000	0.777	3849	0.040	0.080	0.000	0.667
Water Source										
None/River	1376	0.427	0.495	0	1	3849	0.395	0.489	0	1
Borehole	1376	0.521	0.500	0	1	3849	0.551	0.497	0	1
Tap	1376	0.052	0.221	0	1	3849	0.054	0.226	0	1
Age	9164	18.255	17.738	-9	99	20161	17.910	17.370	-9	99
Female	8839	0.515	0.500	0	1	19331	0.506	0.500	0	1
Years of Education	9166	10.237	12.087	0	81	20161	10.286	12.977	-9	91
Mother's years of educ.	8408	18.705	12.926	0	81	18428	18.527	13.191	0	81
Mother's Age	8408	29.943	8.098	12	45	18428	29.220	8.078	12	45
Income Quartile										
Lowest	9141	0.259	0.438	0	1	20161	0.218	0.413	0	1
2nd Lowest	9141	0.255	0.436	0	1	20161	0.235	0.424	0	1
2nd Highest	9141	0.251	0.433	0	1	20161	0.237	0.425	0	1
Highest	9141	0.235	0.424	0	1	20161	0.311	0.463	0	1
Rural	9357	0.622	0.485	0	1	20161	0.582	0.493	0	1
Facility Characteristics										
Distance	7742	4.311	6.747	0	48	12903	4.214	7.312	0	100
Government ownership	7742	0.647	0.478	0	1	12903	0.720	0.449	0	1
Have inpatient facilities	7742	0.650	0.477	0	1	12903	0.643	0.479	0	1
Price of consultation	7742	0.313	0.428	0	5	12903	0.201	0.388	0	2
Index of facility capacity	9357	5.638	2.848	0	8	20162	3.896	3.109	0	7
Per Capita Expenditure										
Total	9357	2.435	1.472	1.139	6.741	20162	3.764	1.676	1.523	9.151
Private	9357	0.437	0.445	0	1.871	20162	0.818	0.611	0.087	3.467
Public	9357	1.222	0.959	0.313	4.004	20162	1.586	0.946	0.464	3.205
MCH	8035	0.087	0.103	0	0.468	20162	0.290	0.171	0.007	0.758
Immunization	8035	0.073	0.044	0.023	0.160	20162	0.206	0.155	0.008	0.599
Sanitation	8035	0.218	0.227	0	0.592	20162	0.347	0.442	0.022	1.458
Diarrhea	8035	0.553	0.601	0	2.229	20162	0.270	0.383	0	1.263
Shares										
Public	9357	0.508	0.208	0.135	0.816	20162	0.403	0.122	0.207	0.588
Private	9357	0.174	0.139	0	0.484	20162	0.203	0.102	0.057	0.513
MCH	8035	0.032	0.030	0	0.105	20162	0.091	0.052	0.001	0.212
Immunization	8035	0.029	0.019	0.014	0.077	20162	0.062	0.041	0.002	0.141
Sanitation	8035	0.109	0.131	0	0.345	20162	0.102	0.106	0.010	0.308
Diarrhea	8035	0.178	0.168	0	0.558	20162	0.066	0.078	0	0.248
Ratio of public to private	8605	5.208	4.523	0.391	17.534	20162	2.954	2.523	0.493	10.379
Years of decentralization	9357	3.144	0.721	2	4	20162	4.460	0.703	3	5
Year 1996 dummy	9357	0.000	0.000	0	0	20162	1.000	0.000	1	1
Years * year 1996 dummy	9357	0.000	0.000	0	0	20162	4.460	0.703	3	5

Appendix 4. Curative Care for Children 0 to 5 years

	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z
Age	-0.067	-3.74	-0.078	-4.15	-0.068	-3.84	-0.066	-3.75	-0.079	-4.21	-0.069	-3.83	-0.069	-3.82	-0.069	-3.76
Female	0.065	1.13	0.052	0.86	0.053	0.94	0.052	0.92	0.050	0.83	0.065	1.13	0.063	1.09	0.055	0.93
Mother's Age	-0.015	-2.73	-0.013	-2.24	-0.014	-2.58	-0.014	-2.59	-0.012	-2.21	-0.015	-2.77	-0.014	-2.70	-0.016	-2.87
Mother's Education	0.009	2.59	0.008	2.12	0.009	2.45	0.008	2.39	0.008	2.14	0.009	2.55	0.010	2.70	0.009	2.58
Income Quartile																
2nd Lowest	0.032	0.32	0.049	0.47	0.049	0.49	0.043	0.43	0.047	0.45	0.032	0.32	0.030	0.30	0.014	0.13
2nd Highest	-0.099	-0.95	-0.135	-1.24	-0.098	-0.95	-0.090	-0.88	-0.133	-1.22	-0.098	-0.94	-0.093	-0.91	-0.132	-1.22
Highest	0.247	2.06	0.207	1.66	0.251	2.12	0.246	2.08	0.209	1.68	0.258	2.15	0.249	2.06	0.222	1.78
Rural	-0.061	-0.64	-0.088	-0.87	-0.073	-0.78	-0.073	-0.78	-0.076	-0.76	-0.052	-0.55	-0.048	-0.51	-0.033	-0.35
Facility Char.																
Distance	-0.005	-1.14	-0.006	-1.50	-0.005	-1.21	-0.005	-1.19	-0.007	-1.65	-0.006	-1.42	-0.006	-1.35	-0.007	-1.53
Government	0.042	0.44	0.076	0.78	0.041	0.45	0.043	0.46	0.082	0.84	0.043	0.47	0.051	0.54	0.050	0.53
Inpatient	-0.010	-0.11	-0.029	-0.27	-0.022	-0.22	-0.024	-0.25	-0.028	-0.27	0.006	0.07	-0.007	-0.07	0.016	0.15
Price	-0.031	-0.28	-0.006	-0.05	-0.005	-0.05	-0.043	-0.40	0.015	0.14	0.015	0.14	-0.018	-0.16	-0.021	-0.20
Index of Capacity	0.035	1.17	0.032	1.06	0.029	0.99	0.027	0.93	0.032	1.05	0.035	1.18	0.035	1.15	0.034	1.13
Per Capita Exp.																
Total	0.133	1.68														
MCH			1.779	**2.47**												
Private					0.304	1.80										
Public							0.236	1.72								
Shares																
MCH									5.651	**2.02**						
Private											1.275	1.83				
Public													-0.676	-1.04		
Public/Private															-0.053	**-2.53**
Years decentralized	0.562	**2.35**	0.423	**2.45**	0.445	**2.50**	0.544	**2.41**	0.101	0.75	0.181	1.35	0.132	0.85	0.210	1.55
Year 1996 Dummy	-1.815	**-3.41**	-3.459	**-3.65**	-2.015	**-3.72**	-1.238	**-2.45**	-2.826	**-3.42**	-2.030	**-3.71**	-2.022	**-2.96**	-1.812	**-3.17**
Years*1996 Dummy	0.183	1.31	0.564	**3.37**	0.290	**2.49**	0.070	0.45	0.542	**3.11**	0.390	**2.92**	0.397	**2.31**	0.303	**2.13**
Intercept	-1.794	-1.84	-1.247	-1.71	-1.241	-1.66	-1.443	-1.70	-0.109	-0.21	-0.436	-0.82	0.318	0.42	0.020	0.04
Observations	1895		1762		1961		1961		1762		1895				1821	
Pseudo R2	0.081		0.0828		0.0773		0.0774		0.0824		0.081				0.0848	
Test Dummy Variables																
chi2(16)	49.94		36.75		52.44		45.76		41.67		53.750				59.71	
Prob>chi2	0		0.0023		0		0									

Appendix 5. Curative Care for Adults aged 15 or more

	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z
Age	-0.005	-3.09	-0.006	-3.72	-0.004	-3.03	-0.004	-3.03	-0.006	-3.72	-0.005	-3.05	-0.005	-3.05	-0.005	-3.16
Female	0.066	1.48	0.051	1.09	0.071	1.62	0.074	1.69	0.054	1.15	0.067	1.49	0.067	1.50	0.061	1.35
Years of Educ.	0.001	0.60	0.001	0.56	0.002	1.02	0.002	0.98	0.001	0.55	0.001	0.58	0.001	0.62	0.001	0.41
Income Quartile																
2nd lowest	0.164	2.26	0.170	2.27	0.178	2.49	0.181	2.54	0.169	2.25	0.160	2.21	0.164	2.27	0.138	1.85
2nd highest	0.322	4.13	0.286	3.51	0.313	4.09	0.326	4.27	0.289	3.54	0.321	4.10	0.328	4.20	0.287	3.59
Highest	0.543	6.03	0.515	5.56	0.539	6.07	0.545	6.17	0.514	5.55	0.538	5.97	0.543	6.03	0.514	5.62
Rural	-0.138	-2.00	-0.144	-2.02	-0.121	-1.78	-0.118	-1.73	-0.145	-2.00	-0.132	-1.91	-0.130	-1.88	-0.136	-1.96
Facility Characteristics																
Distance	-0.012	-2.94	-0.012	-2.80	-0.010	-2.65	-0.011	-2.74	-0.013	-2.87	-0.013	-2.99	-0.013	-3.00	-0.013	-2.93
Government	0.010	0.14	0.007	0.10	0.019	0.28	0.025	0.36	0.012	0.16	0.012	0.18	0.013	0.20	0.005	0.07
Inpatient	0.063	0.97	0.038	0.57	0.045	0.69	0.043	0.66	0.053	0.79	0.072	1.12	0.066	1.03	0.087	1.35
Price	-0.003	-0.05	0.061	0.87	0.042	0.61	0.014	0.20	0.050	0.70	0.030	0.45	0.017	0.26	0.008	0.11
Facility Capacity	0.002	0.08	0.010	0.41	0.002	0.09	0.003	0.12	0.008	0.34	0.000	-0.01	0.003	0.11	0.000	0.00
Health Exp. Per Capita																
Total	0.110	**1.97**														
HIV/AIDS			0.332	**2.14**												
Private					0.388	**3.14**										
Public							0.176	1.84								
Shares																
HIV/AIDS									0.319	0.54						
Private											0.743	1.40				
Public													-0.059	-0.13		
Ratio															-0.037	**-2.43**
Years decentralized	0.386	1.43	0.280	2.46	0.504	**2.48**	0.309	1.57	0.228	2.09	-0.018	-0.13	-0.081	-0.61	0.070	0.46
Year 1996 dummy	-1.699	**-4.30**	-1.595	-4.34	-2.162	**-4.91**	-1.077	**-3.00**	-1.527	-4.06	-1.665	**-3.89**	-1.331	**-2.65**	-1.804	**-4.40**
Years*year 1996 dummy	0.213	**2.03**	0.268	2.77	0.298	**3.29**	0.102	0.85	0.282	2.93	0.356	**3.41**	0.298	**2.39**	0.353	**3.36**
Intercept	-1.564	-1.55	-0.714	-1.55	-1.988	-2.55	-1.231	-1.62	-0.490	-1.14	-0.158	-0.30	0.165	0.31	0.019	0.04
Observations	3293		3095		3411		3411		3095		3293		3293		3165	
Pseudo R-Squared	0.0759		0.0793		0.0737		0.0722		0.0783		0.0754		0.0748		0.0751	
F-test																
chi2(16)	76.07		71.75		92.95		76.27		78.89		95.3		91.52		106.65	
Prob>chi2	0		0		0		0		0		0		0		0	

Appendix 6. Antenatal Care

	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z
Age 21-25	-0.494	-2.67	-0.490	-2.53	-0.365	-2.05	-0.376	-2.10	-0.489	-2.51	-0.485	-2.61	-0.485	-2.61	-0.512	-2.65
Age 26-35	-0.178	-0.97	-0.210	-1.11	-0.089	-0.50	-0.080	-0.45	-0.209	-1.11	-0.174	-0.95	-0.175	-0.95	-0.206	-1.07
Age 36-49	-0.369	-1.61	-0.339	-1.45	-0.265	-1.19	-0.253	-1.15	-0.338	-1.45	-0.381	-1.66	-0.380	-1.65	-0.413	-1.76
Years of Education	0.006	0.95	0.006	0.98	0.007	1.16	0.006	0.96	0.006	1.00	0.006	1.07	0.006	1.06	0.006	0.93
Income Quartile																
2nd Lowest	0.035	0.21	0.051	0.29	0.051	0.31	0.045	0.27	0.050	0.29	0.033	0.20	0.032	0.19	0.131	0.78
2nd Highest	0.027	0.15	0.005	0.03	0.006	0.04	-0.022	-0.13	0.003	0.02	0.033	0.19	0.031	0.17	0.062	0.35
Highest	0.084	0.42	0.220	1.08	0.096	0.49	0.086	0.43	0.217	1.07	0.089	0.44	0.087	0.43	0.115	0.57
Rural	-0.191	-1.14	-0.096	-0.58	-0.173	-1.07	-0.177	-1.09	-0.095	-0.58	-0.182	-1.09	-0.183	-1.09	-0.172	-1.03
Facility Characteristics																
Distance	0.001	0.09	-0.003	-0.41	0.001	0.18	0.002	0.23	-0.003	-0.43	0.000	0.02	0.000	0.00	-0.001	-0.15
Government	-0.264	-1.54	-0.353	-2.16	-0.185	-1.11	-0.197	-1.20	-0.352	-2.15	-0.251	-1.46	-0.253	-1.48	-0.171	-0.98
Inpatient	-0.190	-1.35	-0.163	-1.10	-0.190	-1.37	-0.193	-1.40	-0.164	-1.11	-0.185	-1.32	-0.186	-1.32	-0.200	-1.41
Price	0.228	1.05	0.280	1.19	0.247	1.18	0.192	0.93	0.286	1.20	0.260	1.17	0.258	1.17	0.301	1.33
Capacity	0.081	1.60	0.095	1.88	0.062	1.27	0.062	1.27	0.094	1.87	0.085	1.66	0.083	1.63	0.073	1.38
Per Capita Exp.																
Total	0.152	1.30														
MCH			0.457	0.56												
Private					0.099	0.35										
Public							0.555	**2.68**								
Shares																
MCH									1.793	0.48						
Private											-0.145	-0.12				
Public													-0.182	-0.17		
Ratio public/private															0.006	0.15
Years decentralized	0.420	1.10	0.012	0.05	0.200	0.59	0.865	**2.28**	-0.081	-0.28	0.032	0.13	0.000	0.00	0.107	0.42
Year 1996 dummy	-1.466	-1.70	-1.937	-1.65	-0.946	-0.98	-0.114	-0.14	-1.827	-1.69	-1.159	-1.29	-1.323	-1.27	-0.652	-0.68
Years*year 1996	0.224	1.00	0.458	1.81	0.201	0.98	-0.264	-1.03	0.463	1.72	0.333	1.48	0.375	1.35	0.170	0.68
Intercept	-0.654	-0.41	1.124	1.15	0.464	0.32	-2.153	-1.53	1.434	1.41	1.165	1.22	1.301	0.96	0.919	0.92
Observations	785		752		838		838		752		785		785		758	
Pseudo R-Squared																
Chi2(16)	13.98		12.62		12.32		19.29		12.92		11.95		11.34		10.7	
Prob>chi2	0.5269		0.6319		0.655		0.201		0.6088		0.6825		0.7279		0.7734	

Appendix 7. DPT3 Vaccinations for Children 12-35 months

	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z
Age	0.192	2.13	0.178	1.89	0.202	2.32	0.201	2.31	0.174	1.85	0.194	2.14	0.192	2.13	0.201	2.19
Female	-0.117	-1.34	-0.131	-1.45	-0.135	-1.58	-0.137	-1.61	-0.132	-1.46	-0.118	-1.34	-0.112	-1.28	-0.128	-1.43
Mother's Age	-0.002	-0.38	-0.001	-0.22	-0.001	-0.14	-0.001	-0.16	-0.002	-0.25	-0.002	-0.34	-0.002	-0.35	-0.003	-0.47
Mother's Educ.	0.025	5.65	0.024	5.45	0.026	5.97	0.026	5.95	0.024	5.45	0.024	5.66	0.025	5.61	0.024	5.57
Income Quartile																
2nd Lowest	-0.055	-0.48	-0.022	-0.19	-0.044	-0.39	-0.051	-0.46	-0.026	-0.23	-0.050	-0.44	-0.045	-0.39	-0.082	-0.70
2nd Highest	0.147	1.08	0.116	0.82	0.134	1.03	0.142	1.10	0.123	0.88	0.120	0.87	0.149	1.09	0.063	0.45
Highest	0.503	3.19	0.463	2.87	0.479	3.15	0.476	3.13	0.462	2.87	0.493	3.13	0.509	3.23	0.444	2.79
Rural	-0.206	-1.62	-0.198	-1.48	-0.192	-1.57	-0.186	-1.51	-0.193	-1.44	-0.220	-1.76	-0.218	-1.71	-0.220	-1.73
Facility Chars.																
Distance	-0.011	-1.45	-0.009	-1.16	-0.009	-1.30	-0.010	-1.39	-0.008	-1.17	-0.011	-1.43	-0.009	-1.29	-0.009	-1.25
Government	0.065	0.47	0.045	0.31	0.032	0.24	0.039	0.30	0.051	0.35	0.053	0.38	0.060	0.43	0.048	0.34
Inpatient	-0.102	-0.88	-0.104	-0.85	-0.093	-0.80	-0.090	-0.78	-0.097	-0.80	-0.095	-0.82	-0.101	-0.86	-0.070	-0.58
Price	0.137	0.82	0.123	0.70	0.123	0.76	0.138	0.84	0.125	0.73	0.147	0.85	0.108	0.65	0.104	0.62
Capacity	0.085	2.07	0.093	2.24	0.082	2.08	0.084	2.13	0.096	2.32	0.072	1.78	0.088	2.14	0.077	1.86
Per Capita Exp.																
Total	-0.126	-1.31														
Immunization			-0.740	-0.54												
Private					0.182	0.80										
Public							-0.084	-0.49								
Shares																
Immunization									3.929	0.70						
Private											1.822	1.89				
Public													1.032	1.30		
Ratio															-0.032	-1.14
Years decentralized	-0.570	-1.22	-0.083	-0.33	0.274	0.87	-0.072	-0.22	-0.145	-0.54	0.149	0.62	-0.062	-0.28	0.186	0.72
Year 1996 dummy	0.991	1.32	1.341	1.06	0.229	0.28	0.601	0.95	0.086	0.08	-0.256	-0.33	1.354	1.45	0.297	0.38
Years*1996 dummy	0.051	0.28	-0.176	-0.69	-0.074	-0.47	-0.039	-0.20	0.093	0.35	0.083	0.44	-0.208	-0.93	-0.070	-0.36
Intercept	1.605	0.96	-0.231	-0.24	-1.423	-1.13	-0.107	-0.09	-0.307	-0.37	-1.106	-1.19	-0.826	-0.92	-0.638	-0.76
Observations	1309		1240		1377		1377		1240		1309		1309		1269	
F-test district dummies=0																
Chi2(16)	43.27		47.31		43.56		43.97		46.35		46.98		49.99		47.26	
Prob>chi2	0		0		0		0		0		0		0		0	

Appendix 8. Household Access to Pit Latrine or Flush Toilet (Base Category = No Toilet or Outdoor Toilet)
Category 1: Pit Latrine

	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z
Highest Educ. Level	0.033	7.24	0.033	7.17	0.034	7.41	0.034	7.41	0.033	7.17	0.033	7.29	0.033	7.32	0.033	7.00
Income Quartile																
2nd Lowest	0.383	3.54	0.365	3.34	0.389	3.60	0.397	3.73	0.364	3.34	0.379	3.50	0.386	3.59	0.364	3.32
2nd Highest	0.756	5.39	0.728	5.07	0.698	4.92	0.704	5.02	0.727	5.07	0.762	5.42	0.769	5.47	0.749	5.29
Highest	1.307	5.66	1.251	5.38	1.161	5.07	1.150	5.07	1.249	5.39	1.301	5.57	1.297	5.58	1.270	5.45
Rural	-1.394	-6.50	-1.384	-6.46	-1.425	-6.69	-1.420	-6.59	-1.385	-6.48	-1.387	-6.48	-1.377	-6.43	-1.354	-6.30
Per Capita Exp.																
Total	0.339	**3.75**														
Sanitation			-0.024	-0.10												
Private					1.082	**3.70**										
Public							0.560	**2.85**								
Shares																
Sanitation									-1.077	-1.33						
Private											1.810	1.47				
Public													-0.404	-0.39		
Ratio															-0.018	-0.51
Years decentralized	0.161	0.39	-0.672	-1.71	0.201	0.67	0.132	0.39	-0.687	-1.80	-0.503	-1.25	-0.687	-1.79	-0.609	-1.39
Year 1996 dummy	-1.049	-1.43	0.257	0.35	-1.006	-1.21	0.271	0.37	-0.150	-0.19	-0.426	-0.58	-0.319	-0.33	-0.211	-0.26
Years*1996 dummy	0.003	0.01	0.138	0.56	0.011	0.04	-0.334	-1.12	0.255	1.00	0.221	0.98	0.268	0.89	0.204	0.78
Intercept	1.301	1.48	3.389	4.39	1.551	2.27	1.591	1.83	3.546	4.64	2.927	3.50	3.695	3.89	3.492	4.63
F-test																
chi2(14)	227.23		215.3		244.25		213.62		203.98		223.69		166.94		212.77	
Prob>chi2	0		0		0		0		0		0		0		0	

Category 2: Flush Toilet

	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z
Highest Educ. Level	0.080	10.56	0.082	10.43	0.082	10.74	0.082	10.79	0.082	10.45	0.081	10.58	0.081	10.46	0.081	10.36
2nd Lowest	0.398	0.80	0.371	0.74	0.412	0.83	0.418	0.84	0.371	0.74	0.406	0.81	0.404	0.81	0.417	0.84
2nd Highest	1.486	3.39	1.432	3.24	1.464	3.35	1.468	3.36	1.430	3.24	1.505	3.44	1.505	3.44	1.406	3.23
Highest	2.760	5.75	2.668	5.52	2.615	5.46	2.603	5.46	2.667	5.52	2.763	5.73	2.750	5.72	2.649	5.52
Rural	-4.728	-9.07	-4.648	-8.93	-4.574	-9.39	-4.568	-9.37	-4.649	-8.94	-4.719	-9.07	-4.712	-9.05	-4.604	-8.87
Per Capita Exp.																
Total	0.416	1.72														
Sanitation			0.057	0.08												
Private					1.108	**2.30**										
Public							0.664	1.26								
Shares																
Sanitation									-0.399	-0.16						
Private											2.520	0.90				
Public													-0.763	-0.24		
Ratio															-0.023	-0.24
Years decentralized	0.406	0.48	-0.638	-0.58	0.032	0.04	0.057	0.08	-0.679	-0.65	-0.425	-0.40	-0.672	-0.62	-0.556	-0.56
Year 1996 dummy	-0.445	-0.26	0.556	0.38	-0.081	-0.05	1.274	0.90	0.278	0.18	0.248	0.15	0.286	0.12	0.581	0.31
Years*1996 dummy	-0.575	-1.10	-0.302	-0.50	-0.475	-0.87	-0.902	-1.59	-0.211	-0.34	-0.273	-0.44	-0.186	-0.21	-0.319	-0.48
Intercept	-4.793	-2.67	-2.008	-0.83	-3.785	-2.14	-4.009	-2.31	-1.854	-0.78	-2.791	-1.16	-1.617	-0.48	-1.970	-0.80
F-test																
chi2(14)	47.04		46.23				46.27		45.53		46.93		31.69		42.54	
Prob>chi2	0		0		51.42		0				0		0.004		0	
Observations					0		5425		5033		5221		5221		5101	

Appendix 9. Household's Access to Water (Base Category = River or Natural Source)
Category 1: Borehole

	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z
Highest Educ. Level	0.013	4.06	0.013	4.08	0.013	4.26	0.013	4.25	0.013	4.08	0.013	4.09	0.013	4.06	0.012	3.91
Income Quartile																
2nd Lowest	0.239	2.61	0.263	2.83	0.251	2.80	0.254	2.84	0.262	2.83	0.239	2.61	0.239	2.61	0.204	2.21
2nd Highest	0.427	3.86	0.422	3.74	0.424	3.94	0.426	3.95	0.419	3.72	0.431	3.91	0.430	3.89	0.394	3.53
Highest	0.470	3.83	0.446	3.57	0.450	3.72	0.449	3.72	0.443	3.54	0.472	3.85	0.471	3.84	0.435	3.50
Rural	-1.794	-12.51	-1.792	-12.34	-1.744	-12.24	-1.750	-12.26	-1.795	-12.33	-1.790	-12.50	-1.792	-12.52	-1.802	-12.52
Per Capita Exp.																
Total	0.073	0.52														
Diarrhea			-0.077	-0.36												
Private					0.295	0.96										
Public							0.270	1.20								
Shares																
Diarrhea									0.179	0.22						
Private											-0.355	-0.28				
Public													0.301	0.31		
Ratio															0.033	0.73
Years decentralized	0.492	0.74	0.129	0.38	0.818	1.75	0.867	1.93	0.202	0.67	0.137	0.43	0.184	0.65	0.136	0.38
Year 1996 Dummy	-1.814	**-2.32**	-1.449	**-2.38**	-1.935	**-2.38**	-1.371	**-2.28**	-1.416	**-2.27**	-1.388	**-1.93**	-1.309	-1.56	-0.970	-1.30
Years*1996 dummy	0.366	1.53	0.424	1.91	0.275	1.40	0.067	0.25	0.395	1.85	0.401	1.85	0.361	1.40	0.271	1.21
Intercept	-0.773	-0.44	0.189	0.23	-1.372	-1.09	-1.514	-1.24	-0.019	-0.03	0.208	0.26	-0.093	-0.13	0.003	0.00
F-test																
chi2(16)	102.39		100.68		107.4		105.96		101.57		102.84		102.77		107.03	
Prob>chi2	0		0		0		0		0		0		0		0	

Category 2. Tap

	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z	Coef	Z
Highest Educ. Level	0.039	6.05	0.041	6.22	0.040	6.18	0.039	6.07	0.040	6.19	0.039	6.07	0.039	6.02	0.038	5.85
Income Quartile																
2nd Lowest	0.613	2.12	0.660	2.18	0.622	2.14	0.623	2.16	0.670	2.21	0.613	2.11	0.607	2.08	0.572	1.96
2nd Highest	1.283	4.12	1.356	4.24	1.280	4.11	1.273	4.09	1.346	4.20	1.287	4.12	1.280	4.09	1.223	3.87
Highest	1.915	6.48	1.906	6.13	1.902	6.42	1.894	6.43	1.909	6.16	1.918	6.47	1.912	6.43	1.894	6.36
Rural	-4.652	-10.35	-4.613	-10.15	-4.622	-10.30	-4.636	-10.33	-4.611	-10.14	-4.650	-10.34	-4.650	-10.33	-4.652	-10.20
Per Capita Exp.																
Total	0.057	0.21														
Diarrhea			0.766	1.80												
Private					-0.280	-0.47										
Public							0.423	0.99								
Shares																
Diarrhea									1.840	1.21						
Private											0.211	0.10				
Public													-0.324	-0.18		
Ratio															0.017	0.20
Years decentralized	-0.284	-0.18	0.106	0.16	-0.863	-0.75	0.255	0.23	-0.344	-0.50	-0.505	-0.67	-0.521	-0.75	-0.371	-0.48
Year 1996 Dummy	-1.389	-1.03	-0.564	-0.51	-0.573	-0.39	-0.913	-0.82	-0.668	-0.62	-1.187	-0.98	-1.305	-0.87	-0.532	-0.40
Years*1996 dummy	0.440	0.86	0.184	0.45	0.442	1.13	0.053	0.09	0.357	0.87	0.487	1.17	0.525	0.99	0.200	0.45
_cons	-2.886	-0.70	-4.226	-2.74	-1.293	-0.41	-4.365	-1.42	-3.013	-1.81	-2.318	-1.20	-2.083	-0.99	-2.463	-1.42
Observations	5102		5035		5428		5428		5035		5223		5223		5102	
chi2(16)	36.27		41.64		48.27		36.85		45.93		46.23		45.66		45.81	
Prob>chi3	0.00		0		0		0		0		0		0		0	